Blood profile of West African Dwarf goats fed *Zingiber officinale* supplemented diet

G A Ibhaze[1], A H Ekeocha[2], A N Fajemisin[1] , S O Aro[1], P O Otun[1]

[1]Department of Animal Production and Health, Federal University of Technology, Akure, Ondo State, Nigeria. [2]Department of Animal Production and Health, Federal University, Oye Ekiti, Ekiti State, Nigeria.

Correspondence: begladalways@yahoo.com; Tel: +2348055865289

Abstract
An experiment was conducted to assess the effect of ginger (*Zingiberofficinale*) supplemented diets on the blood profile of West African Dwarf (WAD)goats. Twelve (12) goats with an average weight range of 5.57-6.95kg were randomly allotted to four dietary treatments supplemented with ginger at different inclusion levels of 0, 0.2, 0.4 and 0.6% with each treatment having three animals which served as replicates in a completely randomized design. Prior to commencement of the study, blood was collected via the jugular vein into different sterilized specimen bottles with and without anti-coagulant (EDTA) for haematological and serum biochemical evaluations respectively. This was repeated at the end of the study period which lasted for 60 days. The haematological parameters results obtained at the post trials did not differ significantly while significant reduction was observed in the alanine amino transferase(ALT), aspartate aminotransferase (AST), cholesterol and creatinine values. It was therefore concluded that *Zingiber officinale* has the potential to maintain a good health status in the regulation of serum enzymes, cholesterol which might have adverse health implications if above normal.
Key words: alanine aminotransferase, aspartate aminotransferase**,** haemoglobin, phytogenic feed

Introduction
Ruminant production is vital in supplying man's protein requirement and in sustaining these animals as well as improving their production, they require quality feed and adequate management. The recently observed consumers' demand for quality food products has encouraged the use of Phytogenic feed additives (PFAs) in livestock production (Gardzielewska *et al.*, 2003). Phytogenic feed additives (PFA) are plant products added to livestock feeds in order to improve digestibility, nutrient absorption and elimination of pathogens residents in the animal's gut and by so doing, promote livestock performance (Athanasiadou *et al.*, 2007) as well as maintain the health status of the animals. Ginger (*Zingiber officinale*) a phytogenic feed additive is a rhizomatous herbaceous plant, whose rhizome is used medicinally. It contains several compounds and enzymes including gingerdiol, gingerol, gingerdione and shogaols (Zhao *et al*., 2011). Aside from nutrition, the health condition of an animal is a function of its blood and serum constituent as these determines its immunity to foreign bodies (Okunlola *et al.*, 2015). This study therefore centred on investigating the haematological and serum profile of West African Dwarf goats as affected by *Zingiber officinale* supplemented diets.

Materials and methods
Study area
The experiment was carried out at the sheep and goat Unit of the Teaching and Research farm of the Federal University of Technology, Akure, Ondo State, Nigeria and it lies on the geographical coordinates of

longitude 4.944055°E and 5.82864°E, and latitude 7.491780°N and 6.96375°N with annual rainfall ranging between 1300 mm and 1650 mm. Average maximum and minimum daily temperature of 38 °C and 27 °C in the wet season and 39 °C and 23 °C respectively (Daniel 2015)

Source of experimental materials

Twelve (12) West African dwarf goats were sourced from a local market in Osun state, Nigeria. Composite cassava peel was obtained from a cassava processing mill, the Moringa leaf were obtained from a nearby village in Akure while the Palm Kernel Cake was obtained from a feedmill in Akure. The ginger was purchased from a local market (Oja-Oba) in Akure.

Preparation of experimental diets

The experimental diets were grouped into four; Diet A; Cassava peel (65%) + Moringa leaf (15%) + PKC (20%) + Ginger (0%), Diet B; Cassava peel (65%) + Moringa leaf (15%) + PKC (20%) + Ginger (0.2%), Diet C; Cassava peel (65%) + Moringa leaf (15%) + PKC (20%) + Ginger (0.4%), Diet D; Cassava peel (65%) + Moringa leaf (15%) + PKC (20%) + Ginger (0.6%).

Cassava peel was chopped and the ginger was macerated into smaller size for easy mixing and compaction. All the ingredients were thoroughly mixed manually and compacted inside a 120L plastic silo weighted with a sand bag and sealed to prevent any possible entrance of air and then covered with the plastic lid and allowed to ferment for 21 days.

Management of the Experimental Animals and method of feeding

Twelve female West African Dwarf goats having an average body weight of between 5.57 and 6.95kg were used for the eight weeks feeding trial. The goats (3 per treatment) were assigned to the four dietary treatments in a completely randomized design and housed in individual pens. The goats were tagged and allowed 14 days adjustment period before the onset of the study. All the animals were treated for external and internal parasite**.** The experimental diets were fed to the goats at 8.00am and grass (*Panicum maximum*) was offered at 2.00pm and fresh cool water was supplied daily.

Blood sample Collection and Analysis

Blood samples (5 millimeters) were collected from the goats twice; prior to the feeding and post feeding. The haematological indices were determined as described by Dacie and Lewis (2001), serum total protein (Kohn and Allen 1995), albumin (Peter *et al* 1982), creatinine was determined as described by Ogunsanmi *et al.* (1984).

Results and Discussion

The haematological values obtained is shown in Table 1. There was no significant difference ($P>0.05$) among the treatments. The PCV was higher than 25.7±3.1 obtained for Red Sokoto goats Tambuwal *et al.* (2002) and within the range of 28.4 ± 0.9 obtained for West African Dwarf (WAD) goats by Opara *et al.* (2010) but slightly lower than 35-37.01% for WAD goats fed fermented maize cob based diets (Ibhaze, 2015). It could be said that these goats were maintained on adequate nutrition hence were not susceptible to nutritional stress. Although not significantly ($p>0.05$) different, the increase in the red blood cells when compared with the baseline values suggests that the inclusion of ginger could have improved the oxygen carrying capacity of the goats which indicates absence of anaemia. Moses (1999) associated anaemia with reduction in haemoglobin, accompanied by fall in red blood cell count and packed cell volume. Treatment B had higher value (12.6x106µl) for red blood cells which reflected in the haemoglobin value (10.0g/dl) attesting to the better utilization of the diet. The higher haemoglobin values obtained in diets with ginger inclusion were comparable with 9.9 g/dl reported by Opara *et al.* (2010) for healthy female WAD goats,

indicating the absence of microcytic hypochromic anaemia caused by iron deficiency and improper utilization for the formation of haemoglobin (Olafadehan, 2011).The improved haemoglobin observed in animals at post trial implies efficient utilization of dietary protein by the animals. Additionally, increase in PCV, RBC and Hb is an indication of positive erythropoiesis (Okpuzor *et al* ., 2009). The decrease in WBC observed at post trials showed that the animals health were not challenged. Table 2 shows the biochemical indices of West African Dwarf goats. Total protein level observed differed significantly ($p<0.05$) and was least (80.2g/l) in diet B fed animals. The higher levels of albumin observed in diets supplemented with ginger suggest that ginger could enhance the bioavailability of protein. Odunsi *et al*. (2009) opined that albumin synthesis in animals is related to the amount of available protein present in the diets. The highest reduction (59.51%) in cholesterol was observed in diet B (0.2% ginger) compared to the least reduction (6.38%) in diet A. This observation agrees with the findings of Akhani *et al*. (2004), Saeid *et al*. (2010) who reported that ginger treatment significantly decreased both serum cholesterol and triglycerides in diabetic rats and broilers. Increase in creatinine level is a signal of kidney damage. Although, values were not significantly ($p>0.05$) different, post trial value was highest (2.1mg/dl) in diet A (0%).These results therefore suggest absence of tissue wastage in animals fed ginger supplemented diets.

Conclusion

In this study, it was observed that the inclusion of *Zingiber officinale* in the diets of West African Dwarf goats improved the packed cell volume,haemoglobin, red blood cells and resulted in effective regulation of serum enzymes and lipid metabolism in goats.

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Table 1: Haematological indices of West African Dwarf goats fed *Zingiberofficinale* supplemented diets

Parameters	Period	A(0%)	B (0.2%)	C(0.4%)	D(0.6%)	SEM
Packed cell volume (%)	BT	23.3	29.1	25.1	24.3	0.57
	PT	27.0	30.0	26.0	25.6	0.38
Red blood cell (x10^{6}µl)	BT	9.4	11.8	10.2	9.2	1.10
	PT	11.2	12.6	10.8	9.6	0.69
White blood cell(x10^{3}µl)	BT	301.3	296.3	272.6	286.0	8.69
	PT	266.0	214.0	254.2	229.3	10.15
Haemoglobin (g/dl)	BT	7.9	9.6	8.3	8.1	0.91
	PT	8.3	10.0	9.8	9.9	0.13

Table 2: Pre and Post trial Biochemical indices of West African Dwarf goats

Parameters	Period	A(0%)	B (0.2%)	C (0.4%)	D(0.6%)	SEM
TP(g/l)	BT	83.6[a]	63.0[b]	52.9[c]	59.3[c]	0.62
	PT	87.5	80.2	89.1	81.8	4.81
ALB (g/l)	BT	21.9[b]	23.5[a]	24.9[a]	32.2[a]	3.43
	PT	25.4[c]	33.3[c]	30.1[b]	38.2[a]	0.69
GLO(g/l)	BT	61.7[a]	39.5[b]	28.0[c]	27.1[b]	6.04
	PT	62.1[a]	46.9[b]	59.0[b]	43.6[c]	5.37
AST(iu/i)	BT	83.0[d]	152.0[a]	104.5[b]	123.5[c]	8.27
	PT	35.0[d]	52.0[c]	94.3[a]	68.5[b]	4.74
ALT(iu/i)	BT	10.2	25.0	15.6	15.1	2.19
	PT	7.8[b]	12.4[a]	12.3[a]	12.4[a]	3.50
CHOL(mg/dl)	BT	156.6[d]	349.0[a]	182.2[c]	262.1[b]	8.37
	PT	146.6	141.3	132.2	142.6	11.3
CRET(mg/dl)	BT	3.2	2.8	3.3	3.8	0.46
	PT	2.1	1.9	1.8	1.0	0.71

a, b, c, d = Means on the same row but with different superscripts are statistically different (P<0.05). AST = Aspartate aminotransferase, ALT = Alanine transferase, ALB = Albumin,
TP = Total protein, GLO = Globulin, CHOL = Cholesterol,CRET = Creatinine. BT: Pre-trial, PT: Post-trial.